

PACIFIC PARK SCIENCE

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A report to park managers of recent and ongoing research in parks with emphasis on its implications for planning and management

From the Editor . . .

The National Park dilemma, whether it looms over the whole System as it does in documents like State of the Parks or simply squats in some back-country corner as a single overused campsite, is how to make the best use of what we know about the System in order to perpetuate its treasures for future generations.

Computer banks are bursting with data; scientists talk to one another of their research findings; the mounds of information, the management that uses it, and the public that benefits — all are growing in richness and sophistication. A cursory look suggests that the weakest part of this developing synthesis lies in its linkages. A recent TV documentary on information — from Gutenberg to the computer — left no doubt that humanity now has the means, in effect, to create another almost complete version of the world around us in the form of computer printouts describing every detail. The documentary made much less evident whether or how this fantastic factual array is being used for the ultimate good of human kind.

One thing did seem clear: That more effort is needed to communicate research findings so that the non-scientific world can locate pertinent information and assess it in the light of the human processes that tend to determine how that information is used.

If science and management can each make its own central core of operating knowledge understood by the other, the chances are excellent for narrowing the gap between "what the world is ready for" and "what society is ready for." With all the current emphasis on science — from the new

magazines like *Discovery* and *Science 80* to the hiring of science editors by the non-scientific media — it is doubtful indeed that the drama so mourned by Carl Sagan in "Cosmos," (the burning of the library at Alexandria) will be repeated in this age. However, it is worth noting that it was the failure of science to communicate its message and its worth that led the public of that third century day to sack and burn the library and all it stood for.

Editorial Brief: "Our place in the life of the world is unfathomable because we have so much to learn, but it is surely not absurd. We matter. For a time, anyway, it looks as though we will be responsible for the thinking of the system, which seems to mean, at this stage, the responsibility not to do damage to the rest of life if we can help it. This is in itself an immensely complicated problem, in view of our growing numbers and the demands we feel compelled to make on the planet's resources. There is no hope of thinking our way through the quandary except by learning more, and part of the learning (not all of it, mind you, but a good part) can only be achieved by science, more and better science — not for our longevity or comfort or affluence but for comprehension, without which our long survival is unlikely."

Lewis Thomas, Chancellor,
Memorial Sloan-Kettering Cancer Center
From his 1980 Harvard Phi Beta Kappa Oration

Cover photo:

Student Conservation Association work groups and YACC crews work to re-establish native vegetation on backcountry sites where heavy use has forced temporary closure.

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Research Turns Up Specific Methods For Backcountry Rehab Management

Editor's Note: Two detailed approaches to management, describing scientific responses to problems arising from increasing human use of wilderness have emerged from the Western and the Pacific Northwest Regions and are here excerpted with some paraphrasing and in some detail. By-lines identify the authors in each case, and directions for obtaining the papers in their entirety (including rationale, additional details and lit. cited) are given.

Measuring Impacts of Wilderness Use, by David J. Parsons and Susan A. MacLeod, (excerpted from the article appearing pp. 8-12 in the Oct., Nov., Dec. 1980 issue of PARKS, IUCN publication (limited availability), Robert Standish, editor, c/o National Parks Service, Dept. of the Interior, Washington, D.C. 20240.)

In Sequoia and Kings Canyon National Parks, California, we found it necessary to develop a system whereby campsite impact could be measured but that would be manageable over a large area (more than 348,000 ha) of rugged, remote terrain with numerous undesignated campsites.

This paper presents a method by which the extent and distribution of camp area development, or impact, in the backcountry can be inventoried and quantified. This method, now being used extensively in Sequoia and Kings Canyon NPs, provides a baseline against which to measure future change and a data base on which to evaluate accumulated impact as a product of use level and vegetation type.

Because soil and vegetation conditions in campsites are so susceptible to injury from concentrated visitor use, they are important elements in any system for evaluating backcountry impact. Additional criteria, such as developments (fire rings, wind breaks, tables, etc.) and mutilations (carvings or ax marks) are important visual indications of a developed campsite, but are not as sensitive to different use levels since they can be drastically affected by a small number of users as well as by local management actions.

In developing a system for measuring visitor impact in wilderness campsites we defined a campsite as any area showing evidence of overnight use. Such evidence might include fire rings or cleared areas where tents or beds were used. Where areas are so well developed that individual sites could not be distinguished, sites were delineated on the basis of whether on any given night separate parties would be likely to camp in each site, or in the case of larger sites, whether or not different portions appear regularly to receive independent use. Campsites in the Sequoia and Kings Canyon backcountry are undesignated. They have evolved over 100 years of repeated use and minimal management. They are thus widely dispersed and of vastly differing size and character . . .

The Camp Area Inventory system designed in Sequoia and Kings Canyon NPs uses eight visual criteria to evaluate quantitatively the level and extent of impact in each backcountry campsite. The criteria reflect vegetation and soil damage, as well as the degree of campsite development, without requiring detailed mapping or measuring. Experience indicates that these eight factors, along with measures of site crowding and the distance to water, represent an effective measure of campsite based backcountry impact.

The criteria used, rated on a five point scale include:

Density of Vegetation: A relative measure of extent of vegetative ground cover within the campsite as compared with similar unimpacted areas outside the site.

Composition of Vegetation: A measure comparing the species composition and relative abundance in the campsite to surrounding unimpacted areas.

Total Area of the Campsite: An estimate of the total area affected by trampling directly associated with use in and about the site.

Barren Core Area: An estimate of the area which, due to trampling, has been completely denuded of vegetation. This usually corresponds to the central ac-

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Human Impact Inventory and Backcountry Rehabilitation in Olympic NP: Research and Its Application, by Edward Schreiner and Bruce B. Moorhead. (This paper in its entirety, reprints of results, and a draft of a use manual, may be had by writing the authors at Olympic NP, 600 E. Park Ave., Port Angeles, WA 98362.)

Our purpose in this paper is to describe the human impact research in Olympic National Park and how we have applied this to management. We tried to design a system that could:

1. Provide a survey of backcountry impact over one million acres.
2. Be useful to non-research oriented people.
3. Allow evaluation and comparison of backcountry conditions in different areas of the park.
4. Quantify human impact so sites could be monitored with time.
5. Be useful as a basis for making decisions on site management.
6. Describe patterns between human impact and ecological factors.

The method chosen uses an 8x10 inch "key-sort" card with holes punched along the margins. This allows analysis with or without a computer. The idea was stimulated by the Code-A-Site system of Hendee and others (1976). Code-A-Site allows a survey of dispersed campsites in roaded areas although it also can be used in the backcountry. The Human Impact Inventory (HII) system of Olympic was intended for use in the backcountry and is mainly concerned with the measurement of human impact and ecological parameters.

The HII card includes sections for site description, human impact, vegetation, and management recommendations. Procedure is to make a map of the camp area showing trails, campsites, and prominent features and then to fill out one card for each site. The primary measure of impact is eight line intercepts radiating along points of the compass from the center of the campsite. The distance to the first plant is recorded for each line. The eight lines then are averaged to provide a mean radius from which the area of bare ground is computed based on a circle. The measurements are repeatable so that any large change in campsite bare area can be detected. Photographs of each campsite also are taken.

Results of our investigation show:

1. Impact generally increases as tree canopy cover increases.
2. Areas with an alder overstory are the most impact resistant of the forested communities in the park.
3. Areas with bedrock or large angular rocks near the surface are very sensitive to impact.
4. Our most sensitive forested areas are those with Pacific silver fir in the overstory canopy.
5. Impact in major camp areas varies from 15-3000 square meters of bare ground.

These results have helped us tremendously in determining ways of minimizing impact in the Olympic backcountry. We now consciously shift use to those areas where we know plant communities are the least sensitive to visitor use. In high elevation areas, for example, visitors are being guided toward the less sensitive grass or sedge dominated sites as opposed to those dominated by low shrubs.

An additional benefit to the work is that we are able to rank the conditions of all backcountry areas and can thus set priorities for rehabilitation projects. Initially we are attempting to restore all areas with greater than 800m² of bare ground.

Backcountry rehabilitation in Olympic has reached a stage where it could almost be called backcountry landscaped architecture. Once an area or site has been selected, we try to recreate as far as possible the original conditions of the site. In practice we attempt to advance the successional stage so that the

Continued on page 3

Wilderness Use (continued)

tivity area of the site.

Campsite Development: A descriptive rating reflecting the amount of man-made "improvements" in the campsite. (This rating often is disproportionately low where backcountry rangers are actively maintaining or managing sites.)

Litter and Duff: Applied only in forested areas, this measure indicates the relative amount of pulverization and removal of organic debris (needles, cones and twigs) as a result of trampling and other use.

Social Trails: A measure indicating the amount of concentrated trampling of surrounding vegetation by the formation of access trails to nearby destinations such as water sources, other campsites, main trails, etc.

Mutilations: A measure to document the number of permanent marks on the campsite such as carvings, ax marks, and nails in surrounding trees.

On the five point impact scale level five represents maximum impact, or diversion from natural conditions. Level one represents minimal impact. Each campsite receives a rating for each of the applicable criteria used. The resulting mean value constitutes the campsite's overall rating or "campsite class." With experience, a site can be given a class rating, briefly described, and located on a sketch map of the area in a couple of minutes.

Using this system, a class one campsite usually would be no more than a small sleep site and possibly a fire ring with little or no vegetative change or trampling evident. At the other extreme, a class five site would be a large, heavily used, barren area. Often such sites have numerous leveled sleeping sites in addition to several large, unsightly fire rings and rock walls.

In addition to campsite impact classification, descriptive information on the overstory and understory vegetation, including percent of cover, is recorded. The distance to water and the number of class three, four or five sites within 100 ft. (30.5 m), a measure of campsite crowding, also are recorded. Recommended management actions, if any, as well as the potential for each site to accommodate large groups are noted. All sites are located on a freehand map showing major geographical features, potential camping areas, and compass direction.

It should be noted that the impact rating scales and codes for other site factors have been developed in the southern Sierra Nevada and may require adjustment or refinement for use in other areas. Similarly, depending on the local environment, additional criteria may be found to be more applicable.

For each group of campsites, information characterizing the overall area is noted.

This includes vegetation type, elevation, trail access, land form (i.e. lake basin, river valley, etc.), and an estimate of the percent of the area that could potentially accommodate camping. Such information can be collected as applicable to specific management needs in any wilderness area. The factors to be recorded as well as their breakdown (specific landforms, forest types, etc.) would vary with the area studied.

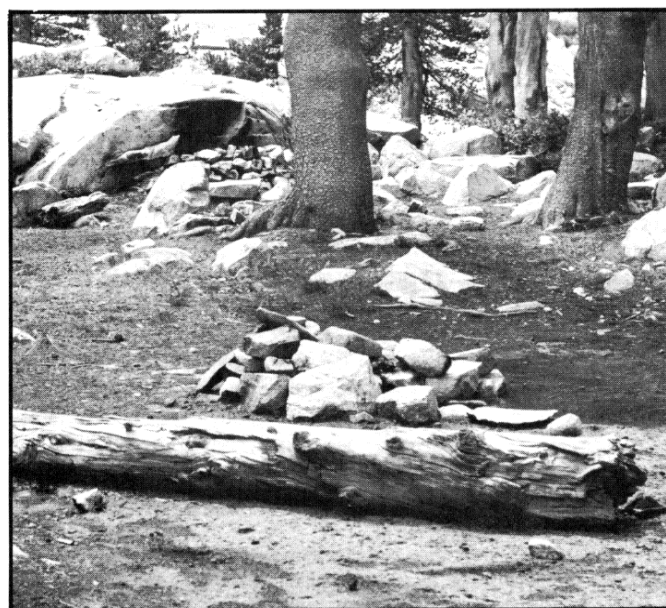
Data on the campsites of a given management area (a lake basin, valley or other readily defineable management unit) then can be summarized to reflect the total number of sites, the number in each impact or class or such parameters as the relative crowding or proximity to water. When analyzed together with the other types of data collected the impact ratings provide a basis for understanding the nature and distribution of visitor impact under varying physical and ecological conditions.

The Camp Area Inventory system as developed and implemented in Sequoia and Kings Canyon has proved to be flexible enough to be applied to all of the varied ecosystems. To date, over 7,400 campsites have been inventoried covering 310,231 ha of backcountry and located in chaparral, giant sequoia, mixed conifer, subalpine forest and alpine vegetation types.

The Camp Area Inventory system described here presents a manageable approach to collecting, summarizing and analyzing data on recreational impact in wilderness camp areas. The system is especially well suited to large backcountry areas with numerous, undesignated, widely dispersed campsites. The data may be analyzed in a number of ways so as to provide both a defensible basis for immediate management decisions as well as a baseline of data against



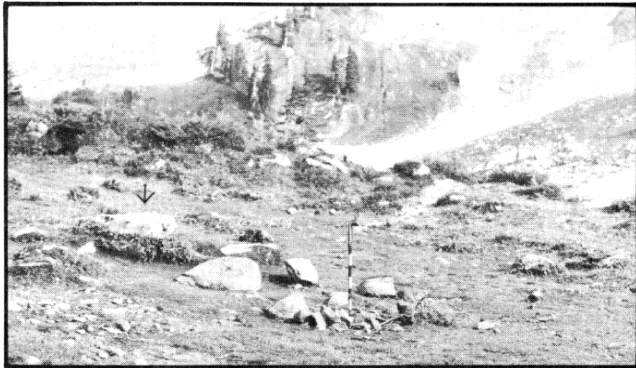
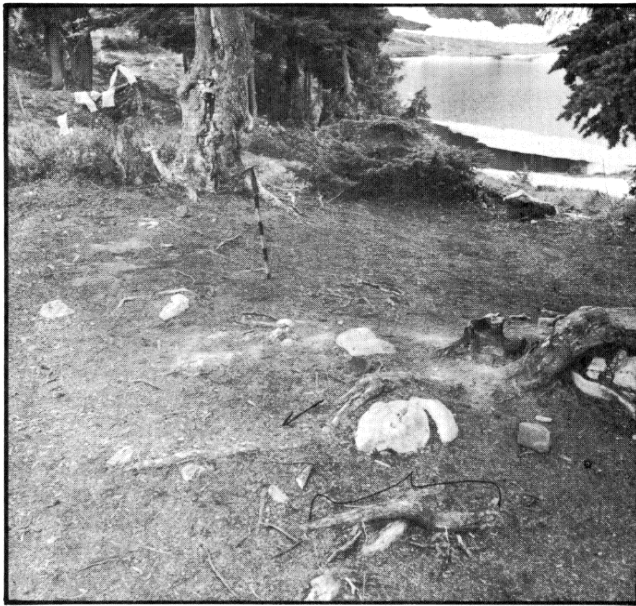
THE ATTRACTION: Bullfrog Lake in Kings Canyon NP shows off the wilderness qualities that draw campers off the beaten path for earned enjoyment.



THE NUISANCE: Close-up of barren core, fire ring and second fire scar in background demonstrates undesirable impact on lodgepole pine forest in Sequoia NP.

which to evaluate future changes. The data provide a valuable basis on which to relate campsite impact to visitor use levels, elevation, vegetation type or any other measurable variable, and also serve as input for computer models that simulate backcountry recreational use and consequent impact. Such analyses should provide the manager with an improved predictive capability of estimating the effects of changing use levels or restrictions before they occur.

Dave Parsons is a research scientist at Sequoia and Kings Canyon NPs. Susan MacLeod, a graduate student at UCal (Berkeley), worked as a research assistant at the parks when the method described here was developed.



SAME TREATMENT, DIFFERENT RESULTS: These paired sets of before-and-after pictures, taken at Lunch Lake in Olympic NP at five year intervals, show continuing erosion (top) at a pink heather dominated site even after removal of the fire ring, but recovery at the sedge dominated

site (bottom) approximately 200 meters away. In both cases, fire ring removal was the only management change. The fact that the lakeside site continued to attract use, even after fire ring removal, indicates that additional changes in management will be required if that area is to be restored.

recovery process is hurried along. We have had excellent results using Student Conservation Association work groups and YACC crews as labor.

An overall plan for the area in question will improve the success of the restoration effort. This plan should include a follow up check on the survival rate of the plants. In some cases, exotic plants invade the recovery area and may need to be eliminated. This has occurred in the Olympic where exotics already were present due to previous horse use.

The General rehabilitation procedures used:

1. Select the sites to be worked on.
2. Find alternate campsites or institute a quota if some are to be closed. Often more campsites are present than are used at any given time. Thus, the maximum number of parties per night using an area should be determined in advance of the restoration.
3. For multiple social trails, make one good trail and eliminate the others, but be careful because each trail is present for a reason. Observation of use patterns is imperative before beginning restoration.
4. Determine the vegetation that would be present and select species for transplanting. Grasses, sedges, and mat forming plants transplant the easiest. Water all plants thoroughly one day in advance of moving them.
5. If a limited number of plants are available, take seeds, cuttings and divisions to a greenhouse or cold frame for propagation and plant them the following year.

6. Dig up the site to a minimum depth of 10 inches. Make certain the compacted layer is loosened.

7. Incorporate several inches of organic matter into the soil. Peat moss and conifer duff are good for acid soils, steer manure for more basic soils.

8. Some people make a general application of fertilizer along with the organic matter.

9. Move the plants into wet holes, adding more organic matter and fertilizer.

10. Add rocks and decomposing logs to provided microsites and to discourage further use of the site. These should be partially buried to prevent visitors from moving them.

11. Water the area, scatter native seeds, and cover with jute netting. Spread organic matter, duff and soil on top of the jute to help it decompose and to reduce visual impact.

12. Stake the jute to hold it in place.

13. Photograph the area and count the transplants by species. It is also worthwhile to record the number and kinds of seeds used.

Careful record keeping is essential to determine the success of different species and treatments. We use natural lines between rocks, trees, and logs to delineate plot boundaries. This eliminates the need for permanent markers and saves time. A sketch map is usually all that is needed to relocate the plots.

It also is important to provide for interpretation of the restoration projects. As a general rule, visitors should know what you are doing, why you are doing it,

People and Places

Van Riper Heads Newest CPSU In Western Region

Able to leap huge oceans in a single bound — at the same time swinging from the oldest to the newest CPSU in the Western Region — Charles van Riper III has made the transition from the Cooperative Park Studies Unit at the University of Hawaii, the first established, to the brand new unit at the University of California, Davis, this time as Unit Leader.

Van Riper, who assumed his new duties in October 1979, is a native of upstate New York. He holds B.S. and M.Ed. degrees from Colorado State University, and in 1978 received a Ph.D. in zoology from the University of Hawaii, with a dissertation on the breeding ecology of the Amakihi and the endangered Paliia, two endemic birds found on Mauna Kea. He has taught at high schools in New York and Hawaii and has worked as a wildlife biologist for the U.S. Fish and Wildlife Service in Hawaii. Most recently he was an assistant researcher with the University of Hawaii.

With more than 50 published articles, technical reports and papers to his credit, Van Riper has centered his research around avian ecology and ecological parasitology, with emphasis on endangered species.

His most recent research, dealing with the impact of introduced diseases (principally malaria) on the native birds of Hawaii, was done mostly within Hawaii Volcanoes NP. The park offers the only continuous corridor of natural flora and fauna that reaches from sea level to the mountains. Elsewhere the land is checkered with plantations. The continuous monitoring program conducted as part of



this research resulted in major maintenance changes in the park, and a future issue of *Pacific Park Science* will deal with the management aspects of this research. Meanwhile, Van Riper is working with a computer matrix of 4 million data points as he nears the March 31 deadline for his written report on the project.

Van Riper recently completed a survey of endangered raptorial birds in Lassen Volcanic NP and is planning future research projects at Yosemite and Channel Islands NPs. As an adjunct assistant professor in the UCal-Davis zoology department, Van Riper will teach, direct graduate students, and conduct research at the University.

In addition to the Unit Leader, the CPSU staff currently is composed of a Unit coordinator, Dr. L.D. Whittig, and a secretary, Janet Tilson.

Improved Water Management is Team Effort Aim

A diversified water resources team, capable of responding to NPS park problems and to Congressional and Executive mandates to protect water and related land resources has been established at Fort Collins, CO. The new Water Resources Field Support Laboratory occupies space and enjoys support services under the existing CPSU arrangement with Colorado State University.

The staff of seven, headed by Ray Herrmann, was assembled to develop, coordinate and assist in interagency efforts to improve Park Water Resources Management. Staffing of the unit represents a redirection of the Washington office and incorporates a variety of specialties — hydrology, geology, engineering, water allocation, and ecology.

Fort Collins has become an active center for Federal and state laboratories developing answers to resource management questions. The combined expertise of five special offices of the U.S. Department of Agriculture, including a national computer center, two cooperative Department of the Interior study teams, the Natural Resources Ecology Lab, and Colorado State University act as a magnet for other high caliber resources study labs. Many of the new NPS lab's responsibilities, such as improvement of NPS water resources data analysis, will be accomplished in close cooperation with the other Federal and state agencies at Fort Collins.

Herrmann invites inquiries, problems — even complaints — to be addressed to him, National Park Service, College of Forestry and Natural Resources, Colorado State University, Fort Collins, CO 80523.

Olympic Rehab (continued)

and the location of the restoration sites and alternate camp areas. Methods can include short signs, maps of the project, and samples of jute with an explanation in ranger stations and visitor centers. A more elaborate method, which we intend to try in the future, is to provide before and after photographs of the sites themselves. Ideally these will be taken from the same point where the sign will be placed.

Overall our efforts have been reasonably successful. Olympic's backcountry is in better condition now than it was six years ago at the start of the project. We have used research as an effective tool for establishing a management program.

Ed Schreiner is a biological technician and University of Washington doctoral candidate. Bruce Moorhead is a research biologist at Olympic NP.

Three publications available through Schreiner at Olympic NP are "Investigative Methods for the Study of Site Response to Human Trampling,"

Schreiner (1975), 15 pp., presented at the Second Annual Research Biologists Conference, USDI/NPS/PNR; "Human Impact Studies in Olympic NP," Schreiner, E., and B.B. Moorhead (1976), in Proceedings; Terrestrial and Aquatic Ecosystems Symposium, Cheney, Wash., NW Scientific Assn.; and "Human Impact Inventory and Management in the Olympic NP Backcountry," Schreiner and Moorhead, (1979), pp. 203-212, in R. Ittner and others, editors, Conference Proceedings, Seattle, Wash., USFS/USDA and NPS/USDI, R-6-001-1979.

The authors would like to acknowledge the support of the Pacific Northwest Regional Science Office in getting this project started. They provided field assistance and cards to Olympic and support for the training of individuals at North Cascades and Mount Rainier where Human Impact Inventory is also in use. Reprints of our results and a draft of a use manual are available from the authors on request, 600 E. Park Ave., Port Angeles, WA 98362.

U.S. - CHINA SCIENTIFIC EXCHANGE

Editor's Note: In the spring of 1980, a cooperative agreement was signed between the Ministry of Forestry, People's Republic of China, and the University of Idaho, authorizing an exchange of faculty between the University and the forestry colleges in China, and proposing several joint research projects. For the first exchange, held in the summer, 1980, a short course on forest recreation was developed for China presentation. Gary E. Machlis, sociology project leader at the University of Idaho (CPSU) and William McLaughlin, asst. prof. of wildland recreation, organized the course materials and lectured. Sponsors in China (Beijing College of Forestry, Nanking Technological College of Forest Products, and the Shanghai Park Service) were responsible for selecting students, providing housing, and organizing field trips.

By Gary E. Machlis

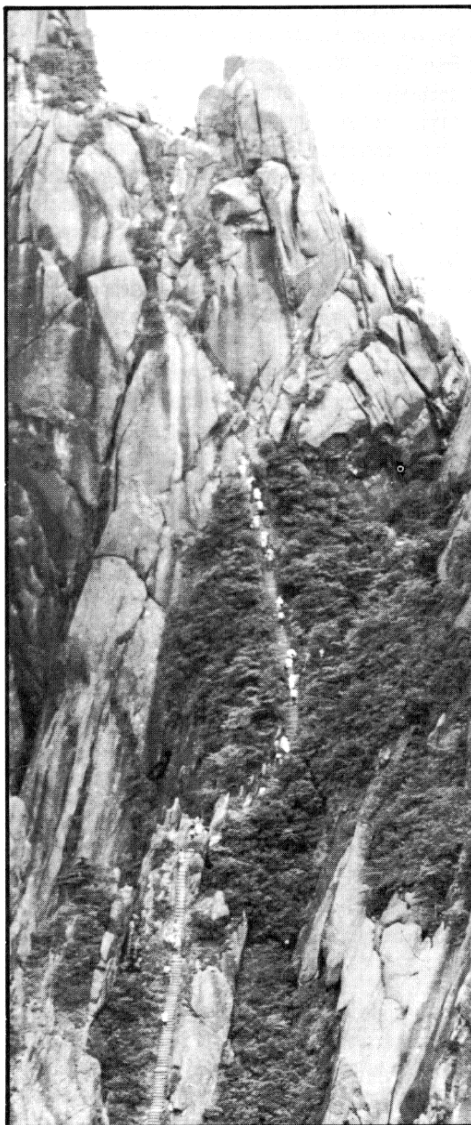
The 64 students from throughout China who attended the four-week short course during the summer of 1980 included faculty from several colleges in forestry, agriculture and architecture, as well as park superintendents, park managers and planners. The main intent of the course was to provide students with an overview of forest recreation, focusing on those materials useful for development of a national park system.

After the class, we traveled for three weeks, visiting tourist sites, scenic spots and potential national parks. Highlights of the tour included a four-day stay at Huangshan in Anwei Province, and several days at Guilin on the Li River. We gave several special lectures, including an address delivered at the Shanghai People's Hall of Science and Technology, and we collected data throughout the trip — a survey of park visitors, visitor use and scenic spots, and personal journals.

National Parks in China

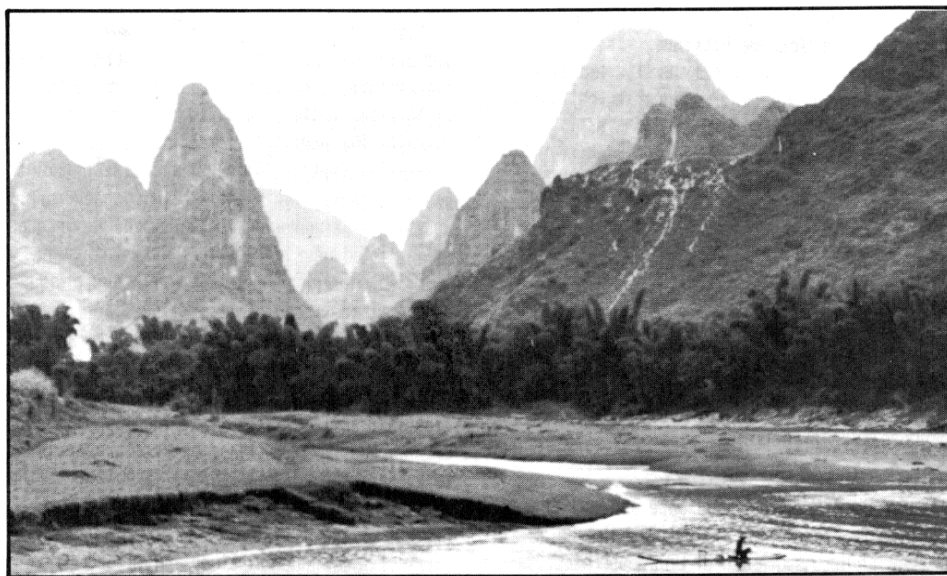
China presently is organizing a National Park System, and there are many areas that will qualify for such status. Huangshan is an excellent example for it occupies a central spot in China's artistic, cultural and environmental heritage. The provincial park is located in southeast China, in the Anwei province. It is approximately 154 square kilometers, and at its highest peak is 1870 meters above sea level . . . a mountainous area, a natural botanical garden, and rich in wildlife (including 13 endangered species). Trails provide access from park headquarters, and facilities can accommodate 4000 overnight visitors. In 1979, 281,592 people visited Huangshan. Of these only 370 were foreigners.

On return from the PRC, I prepared several documents. *A Report on the Exchange Between the National Park Service and the People's Republic of China* was written for Director Dickenson and Pacific Northwest Regional Director Tobin. *National Natural Parks for China*, coauthored with Dr. McLaughlin and Yen Lin-Chang, a Chinese park professional who recently studied at the University of Idaho, was prepared for the PRC government. Both documents



Trail to Heaven: (left) For untrained legs, this trail to the Heavenly Capital City at Huangshan must seem more like "the other place." The Chinese evidently do not believe in switchbacks. Their straight-line philosophy is even more impressive in the light of the Heavenly City's supply problems; namely, that every mouthful of food and drink for the nearly 300,000 visitors per year and all the sewage they generate is carried on the shoulders of human bearers (above) up and down this trail — the same trail used by all visitors going into and out of the park.

Li River near Guilin: (below, left) Karst topography (a limestone region marked by sinks and interspersed with abrupt ridges, irregular protruberant rocks, caverns and underground streams) makes up the spectacular landscape through which the Li River flows.



(Continued on Page 6)

U.S. - China

argue for an active exchange program between the National Park Service and the People's Republic of China. Such a program is likely to be a significant part of a wider cultural exchange, for national parks are important components to national identity, cultural pride, and worldwide cooperation.

Longterm Information Exchange

During the reign of the Gang of Four, scientific information was not disseminated in China. Therefore, most natural resource agencies and universities are in need of current scientific reports, publications and so forth. This project would set up an on-going information exchange on park-related research (biological and social).

In addition, an exchange of experts is clearly called for. Chinese scientists could be invited to work, train and present papers in the U.S., and NPS scientists could be loaned to the PRC for specific research projects. A similar program could be established for resource management specialists.

Several of the design and engineering problems facing Chinese parks are similar to NPS situations. A sharing of experiences and exchange of professionals would aid the Chinese in choosing among alternative design solutions and would suggest innovative solutions for American situations. Examples would be the sewage disposal problems at Huangshan, and the unique trail designs prevalent in Chinese parks.

Training Program

There are no courses in outdoor recreation management in China, although several universities are contemplating such a program. A special session of the ranger skills course at Albright Training Center could be combined with academic training at an American university. The University of Idaho recently had a Chinese professional studying wildland recreation management in the college of forestry, wildlife and range sciences; she briefly attended the ranger skills course at Albright and found the combination rewarding. Another alternative would be to provide a traveling training program throughout China.

A Cooperative Science Program

The parklands of China and the U.S. represent a natural laboratory for comparative research, matching similar park ecosystems. In the case of parks that serve as biosphere reserves, this approach may be useful in longterm monitoring of impacts.

A variety of other scientific studies present themselves — ecological description of park flora and fauna, analyses of environmental change due to rapid development, sociological research concerning visitor behavior, and so on.

The national heritage, the beauty, and the potential of parklands in China suggest a sense of mission — a worthy contribution on the worldwide scene to the national park movement!

Southeast Asia Report

Napier Shelton, of WASO science and technology publications, was an NPS observer last October at a meeting of the Association of Southeast Asian Na-

tions (ASEAN) U.S. Business Council in Singapore. Shelton and the meeting's co-chairman, William E. Franklin of Weyerhaeuser (Far East) Ltd., opened discussion on the U.S. government's concern for tropical forests. Shelton distributed copies of a recent interagency report to the President, "The World's Tropical Forests: a Policy, Strategy and Program for the U.S.," plus the recommendations from the March 1980 UNEP meeting on tropical forests in Nairobi. Franklin expressed willingness from the U.S. side of the Council to provide technology for reforestation in ASEAN countries — an offer warmly received.

Shelton also met with Dr. Francis Ng, acting deputy director for research of the Malaysian Forest Research Institute near Kuala Lumpur, visited two plantations near Malacca (oil palm, rubber, and cocoa), and talked with Dr. Boonsong Lekagul, the 80-year-old "father of conservation" in Thailand. A detailed trip report, made by Shelton to the NPS directorate, can be had by writing the author at the Department of the Interior, Washington, D.C. 20240.

From WASO

NPS Integrated Pest Management

Editor's Note: On Nov. 18-20, 1980, regional pest control coordinators met in WASO with Division of Natural Resources staff to review the pest management program and proposed future directions. Mike Ruggiero provided this summary.

by Michael Ruggiero

Integrated pest management (IPM) can be described as a systems approach to pest control that attempts to maintain the density of pest populations below specified injury levels. These levels may vary in magnitude and purpose with regard to specific management goals. For instance, a farmer may wish to keep a bollworm population below a level that will affect the yield of his cotton crop, a campground manager may want to minimize the nuisance level of mosquitoes, while a groundskeeper may wish to maximize the aesthetics of a lawn by controlling the dandelion population. Although the actual density at which a population becomes objectionable might vary with a particular situation, the general principles of integrated pest management remain constant.

Probably the most important component of sound pest management is a monitoring program. Target pest populations as well as their natural enemies should be under constant surveillance. Only thus can one establish levels at which treatment is necessary. Treatment should be based on a thorough review of existing remedies and should be a combination of effective and the least threatening to humans or the environment. Preventive, mechanical, biological, cultural, chemical, or sociological tools can be used singly or in combination. Monitoring should continue

after treatment to evaluate effectiveness. As successful IPM strategies are developed, educational materials should be developed to benefit others with similar problems. In many cases if thought is given to pest management before construction or development begins, problems can be prevented.

Commitment to sound pest management with minimal use of chemical pesticides has long existed in NPS, in management policies if not always in actual practice. Recently the Service has undertaken new initiatives to implement this commitment.

Credit for a major jump in this direction goes to Dr. James Sherald of the National Capital Region (NCR). In cooperation with the Environmental Protection Agency and the John Muir Institute, Sherald has initiated a three-year pilot urban IPM program. Significant steps were made the first year in managing some of the Service's commonest pests — mosquitoes, Japanese beetles, rats, yellowjackets, dandelions — through improved sanitation as well as mechanical, cultural, and biological controls.

The principles and strategies developed from the NCR microcosm could well form a basis for a servicewide IPM implementation. The division of natural resources at WASO currently is developing the necessary administrative and informational base to effect such a transition.

State of the Parks: Current Position

On Oct. 27, 1980, in a memo to his associate director for science and technology and his chief of the natural resources division, PNR Director Tobin announced establishment of a regional committee on threats to the parks (to be chaired by the deputy regional director), called for expansion of interagency contacts and cooperation, and made responsibility assignments aimed at funding the research, management and maintenance activities associated with resource threats in such a way as to avoid both duplications and omissions. Ro Wauer prepared the following capsule of "threats" history, from Congressional request to the current status of Service response. It is here presented as framework for regional response action.

by Roland H. Wauer
Chief, Division of Natural Resources

In July 1979, the House Subcommittee on National Park and Insular Affairs requested that the National Park Service undertake an overview of existing and potential activities and forces, emanating both from inside and outside park boundaries, which may be damaging or threatening to the natural and cultural resources of the National Park System. In response to that request the National Park Service, in May 1980, submitted to the Congress the findings of a study titled, "State of the Parks - 1980." The most significant findings in this study were that: (1) virtually no park, representing all sizes and use categories and types of ecosystems, was immune; (2) a surprising 75 percent of the 4,345 reported threats to park resources had been classified by onsite park observers as inadequately documented by either private or government research; and (3) the Service must significantly expand its research and resources

management capabilities to mitigate the current threats and to prevent further deterioration of park resources.

The report received considerable review and support by the press, conservationists, and the American public. It has provided a realistic data base on which to build a vitally needed program of resource problem prevention and mitigation. The Service has utilized this report in its justification for requesting additional allocation of funds and personnel. The data derived from the study have become baseline information for future data-gathering efforts and an NPS resources environmental index.

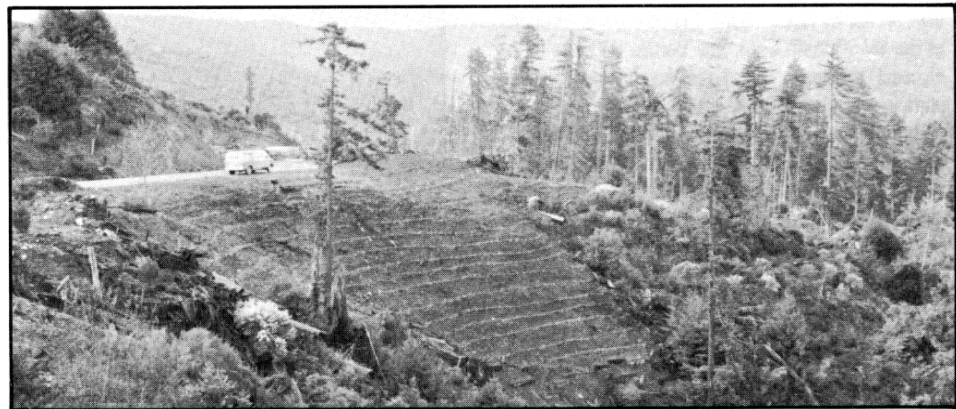
As a followup to this report, the House Subcommittee requested the Service to prepare a second report, explaining short- and long-range actions anticipated. In December 1980, the Service submitted a second report titled, "State of the Parks: A Report to Congress on a Servicewide Strategy for Prevention and Mitigation of Natural and Cultural Resources Management Problems." This report outlines a systematic program of threats prevention and mitigation to be implemented within the more than 320 units under NPS stewardship.

That strategy includes a program of park problem evaluation and ranking that begins with the development of Significant Resources Problems (SRP's) in every park and is followed by an upward evaluation to where the highest priority SRP's become the basis for the Service's natural and cultural resources FY 1983 budget submissions. Similar ranking will occur annually through the use of revised area Resources Management Plans. Revised Plan guidelines already have been completed and distributed to the field.

Campus Lecturers

NPS scientists and technicians have been active on the academic lecture circuit. Those who recently addressed the class on ecological aspects of park management at Oregon State University included Don Field (see story page 17), PNR associate director for science and technology; Jim Agee, research biologist at the University of Washington CPSU (on fire ecology); Mark Forbes, resources management specialist at Crater Lake NP; Ed Schreiner, biological technician at Olympic NP, and Katharine McArthur, graduate student at OSU in wildlife and formerly on Glacier NP staff (grizzly bear/human interactions at Glacier). The class is part of the CPSU responsibilities of Ed Starkey, project leader of the OSU/CPSU.

Other Olympic NP scientists participated as guest lecturers in three meetings of a wildlife management class at Peninsula College in Port Angeles, Washington. Bruce Morehead and John Aho conducted a workshop on animal restraint training ("Techniques of Wildlife Management") and led a seminar on "Wildlife Problems in National Parks." Doug Houston presented "Perspectives on Ecosystem Management: The Yellowstone Elk Program," also given in December at the University of British Columbia.



HEALING PROCESS: (top) The massive wounds left by logging on the body of Redwood NP are being treated with intensive care

(bottom) by the largest resource management/science staff of any park in the National System.

Redwood Restoration Efforts Succeeding

By Stephen D. Veirs, Jr.
Research Scientist, Redwoods National Park

NPS natural areas generally are thought to have been cut, in pristine condition, from the whole cloth of public lands. But many park areas, including Isle Royale, Shenandoah, Big Cypress, Redwood, Acadia and Everglades, were obtained in part or whole for the public following private ownership, and in some cases after being logged or otherwise altered from the natural state.

Portions of some parks have required time to allow natural processes to heal the damage from earlier consumptive land uses. In other cases, like restoring the "hole in the doughnut" in holdings at Everglades or the reintroduction of fire in forests of Yosemite and Sequoia Kings, active rehabilitation programs have been necessary to speed the healing process and begin to re-establish natural conditions. By far the largest NPS rehab program in a natural area is that now underway at Redwood.

When Redwood was established in 1968, Congress expressed concern about the potential impact of timber harvest outside the park on park resources, especially the Tall Trees Grove adjacent to Redwood Creek. This concern was due in part to the unusual physical setting of Redwood. High winter rainfall,

rapid continental uplift and deeply sheared rocks all contribute to the highest natural erosion rates anywhere. Streams in and near Redwood move sediment at rates 10 times higher than the Colorado.

The process of timber harvest on the steep slopes above the 1968 parklands exacerbated natural erosion. Tractor trails, road construction, the removal of forest vegetation, and a series of major winter storms temporarily increased erosion rates above the capacity of the stream to transport the eroded material to the sea.

This situation, documented by the Service and the U.S. Geological Survey as early as 1972, caused serious changes in the streams draining into and through the park. Aquatic resources were altered and streamside groves were damaged or endangered by elevated and widened stream channels, streamside landslides, log jams and gravel deposits.

As the magnitude of the problem became more apparent, Congress responded in 1978 by adding 48,000 acres to the park and by authorizing a watershed rehabilitation program. The goal is control of excessive erosion due to modern human land use, re-establishment of vegetation, and eventually the restoration of near-natural aquatic and terrestrial conditions in the park.

Some experimental rehabilitation work was under-

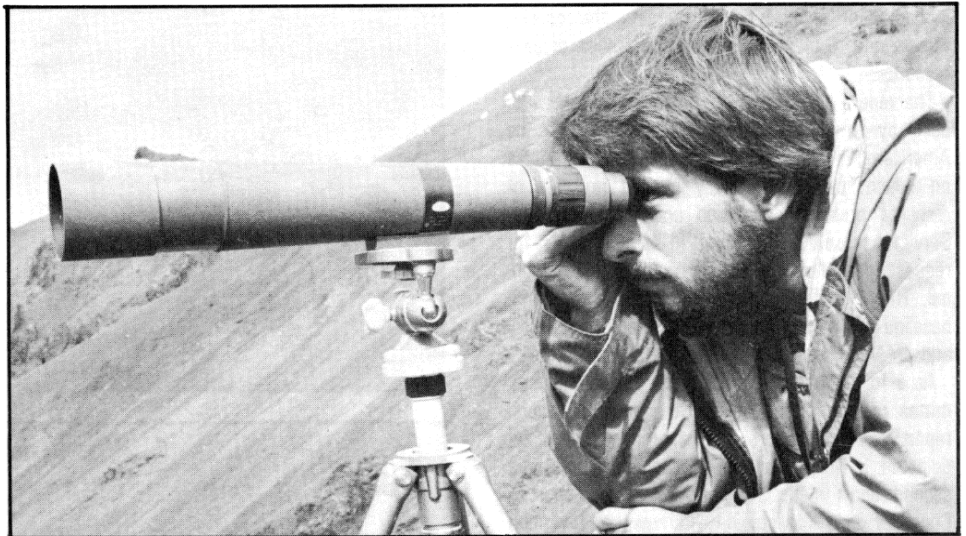
taken in 1977 prior to park expansion; however, the work only now is in full swing. In 1978 the permanent park staff included a research scientist, engineering geologist, forest hydrologist and forester. That small staff grew by the end of 1980 to a total of 22 permanent scientists and more than 50 temporary appointments including geologists, plant ecologists and archeologists, with added support in the administrative division. The combined program for FY 80 amounted roughly to \$2.25 million. The active rehab program now is largely conducted by the division of resource management headed by Don Reeser, formerly of Hawaii Volcanoes. Planning, rehabilitation technique development and rehab evaluation is carried out by the technical services division led by Assoc. Supt. Lee Purkerson, formerly of the WASO staff. Supt. Bob Barbee thus has at his disposal the largest resource management/science staff in any park area.

The program was authorized at \$33 million and is expected to last 10 to 15 years. The work proceeds in steps. Geologists and hydrologists identify the most serious erosional areas. These are mapped and a detailed treatment plan prepared during late winter and early spring. When dry weather arrives, bulldozers, backhoes, draglines, and other heavy equipment go to work. Contract equipment operators under the direction of physical scientists and technicians begin restoring natural drainage patterns. This involves removing stream crossing fills and old culverts, out-sloping roads, removing ditches, reshaping old landings and diverting gullies. As this work proceeds, hand crews begin building check dams, gully plugs and other erosion control devices. Straw, wood chips, and other mulches are spread over the exposed surfaces, which also may be seeded with grasses. As the autumn rains begin, vegetation specialists begin planting native shrubs and trees to control erosion and speed re-establishment of native vegetation. Through the winter, field crews monitor the rehab work, repair failures, and treat problem areas. In late winter the cycle begins anew.

In 1978 about 300 acres were treated experimentally; in 1979, 1,100 acres, and in 1980, 1,500 acres. As each season passes, new techniques are tried and less effective treatments are abandoned, yielding a solid body of rehabilitation techniques now operational.

At Redwood, the NPS has responded to a severe man-caused environmental problem. The problem is not licked, but the erosion control and restorative process has moved into a strong operational mode. The watershed upstream from the park still is yielding a high sediment load, but NPS scientists and resource managers are optimistic about their ability to deal with these problems.

Service employees are well into a significant program designed to rehabilitate, restore and perpetuate an exemplary natural resource – the redwood forests and their associated streams and wildlife.



McKinley Brown Bear Studies Continue

Knowledge of seasonal patterns of brown bear habitat utilization and activities is important for recreational planning and basic to understanding the biology of bears. Work toward increasing this needed knowledge went forward at two study locations in McKinley Park, both above timberline.

Jim Stelmok, a wildlife graduate student at the University of Alaska, working with the Alaska CPSU, followed the daily movements of bears within study areas at Sable Pass and along the Toklat River – the river area consisting of a wide glacial stream bed and adjacent gravel bars with shrubland and tundra slopes, the pass area composed mainly of sedge, shrub and dryas tundra types with tall shrubland along swale and streams.

Each area was observed from a fixed position on an adjacent mountain for about 500 hours during the field season (May 8 to Oct. 10, 1980) and scats were collected for food and calorimetric analyses. Bear movements were followed on aerial photographs during the mapping of vegetation, and changes in activity or vegetation type were recorded. Habitat use and activity data have been coded and entered on computer files.

The daily activity pattern of bears May through July showed a mid-day/afternoon peak of inactivity. During the fall berry season at both sites bears fed almost continuously throughout the day. Information on bear diets, eating and nursing habits, and the behavior patterns of single bears and bear family groups will be available in thesis form by May 1981. References for the work will include Adolf Murie's *The Grizzlies of Mount McKinley* (No. 14 of the NPS Scientific Monograph series) and L.A. Viereck and C.T. Dryness's 1980 "A Preliminary Classification System for Vegetation of Alaska," a Pacific Northwest Forest and Range Experiment Station General Technical Report (PNW-106).

Jim Stelmok, a wildlife graduate student at the University of Alaska who is working with the Alaska Cooperative Park Studies Unit, watches brown bear use of habitat in the Toklat River valley, Mount McKinley National Park. Dall sheep watch the watcher. Fred Dean snapped them all.

Crater Lake Limnology Update

Sample analyses of 1980 phytoplankton samplings at Crater Lake are nearing completion at Beak Consultant laboratories in Portland, Ore. The work is part of ongoing research by Doug Larson, U.S. Army Corps of Engineers limnologist, and Stan Geiger of Beak Consultants.

In addition to vertically profiling algae sampled at the Lake station in 1978-79, the 1980 summer studies included determination of spatial differences in phytoplankton composition across the lake, carbon 14 productivity measurements for comparison with data for 10 years earlier, vertical profiles of water chemistry and chlorophyll *a*, and light and Secchi disc transparency measurements. Scanning electron microscopy was used to assist identification of small diatoms that are abundant in the lake at depths near 200 meters.

Larson and Geiger were joined in 1979 and 1980 by John Prisco of the University of California at Davis, a limnologist working out of UCal's division of environmental studies under the direction of Dr. Charles Goldman. His work was on phytoplankton primary production and vertical abundance of particulate nitrogen, particulate carbon, and protein.

The plan is to continue research, with emphasis on measuring lake spectral qualities and the vertical distribution of particulate matter. All three researchers have indicated great interest in helping interpreters incorporate their study results into visitor information that will make the lake "come alive" as an evolving phenomenon.

Sci and Tech Group Formed at Olympic NP

Whom do you consult when wrestling with management problems, such as air and water quality threats to park resources, exotic mountain goats altering plant communities, and loss of native gene stocks of anadromous fish, to mention a few? Why, you welcome any friendly face and empathetic ear, of course! But, to help Olympic Park managers, Superintendent Roger Contor has formed his own staff of consultants, the Science and Technology Group.

A staff reorganization provided the nucleus for the Group. A hard look at the role and function of existing positions and at management programs showed that several categories of threats to the park will be better met with an in-park team — resource specialists and research scientists working with line managers — than by the more traditional Resource Management and Visitor Protection organization supported by outside researchers. The team effort and specialist services are key points.

Superintendent Contor strongly asserts that rangers and maintenance workers are the parks front-line resource managers and will make the management decisions. To provide these front-line managers with state-of-the-art technology, scientific data, and program start-up assistance in the field, the parks' consultants are on-hand and available. "Plain-language communication and timeliness of results are measures of our effectiveness in helping managers solve resource problems," Contor explained. "Our consultants will not work in the abstract, but will deal with real things like people, goats, fish and some very pressing problems."

Many recurring management activities have become more complex. Greater public awareness, legal constraints, increased environmental degradation and pollution around the park, and tighter budgets all complicate the manager's primary job of preserving the park's resources. We must examine our traditional programs and activities in resource management, and our use of science and technology. Scientists must work closer to the problem, and will be held accountable in the real world for their work. Data and methods must withstand public as well as academic scrutiny. By the same token, managers too must work beyond themselves and review their assumptions and values.

The Science and Technology Group staff is small, but it is intended to grow. Presently, Group Chief John Aho serves as administrator and as the park's forestry/fire management specialist. Bruce Moorhead and Dick Starr complement each other as resource specialists in wildlife and plants, respectively. Ed Schreiner is a biological technician, working on revegetation of campsites and trails. Douglas

Houston, PNRO research biologist, is on longterm assignment to Olympic NP.

Goats, anadromous fisheries, and fire management are the three highest priorities at this time, in addition to on-going programs such as, revegetation of human-impacted sites and air and water quality monitoring.

"Our highest staffing priority is a fulltime fisheries specialist," said Contor, while discussing the role of his new Group. "At present we are only just becoming aware of the threat to native gene stocks of anadromous fish. We must now size up the problem and begin to manage our own fisheries. For too long, other agencies have been, indirectly, doing this for us. Our Science and Technology Group is engaged in rapid gathering of data about our fisheries and the influence of other agency enhancement programs. Most of what we are learning worries us greatly. We may be too late to preserve even one native stock of anadromous fish."

Crater Lake Visitor Study

"We never do have quite enough knowledge about what people want to do . . ."

This often voiced observation from superintendents was put into words most recently by Jim Rouse, superintendent of Crater Lake NP in Oregon, where studies of visitor traffic flows are providing specific clues about "what people want to do."

Bo Shelby, resource sociologist in the Oregon State University School of Forestry, working with Ed Starkey, head of the NPS/CPSU at OSU, entered the Crater Lake scene in 1977/78, when Frank Betts was superintendent and major redevelopment at Rim Village was in the wind.

With Don Wolf, then a research assistant in the forestry school, Shelby put together a design and visitor behavior study that mapped traffic flows into, around, and out of the lake area, and recorded the

observed movements of visitors after they left their cars.

Placement of parking areas was found to have the highest single effect on what visitors did. Most people crowded together at the Rim Village parking area, which offers a wide view of the lake, bought souvenirs at the gift shop, and then left the area. All but 15 to 20 percent missed the visitor center at the Rim Village area and the superb Rim Drive.

This all changed one day when the large cafeteria parking lot area was closed for construction work and more parking was made available near the visitor center. Capitalizing on this natural "field experiment," researchers found that the same number of visitors spent the same amount of time purchasing gifts, but the visitor center also was buzzing with activity. More than twice as many people visited the place where information about the lake — its history and geology — was displayed.

The study also found that at the first possible turnout with a view of the lake for visitors entering the park from the north, 65 percent were pulling off the road and stopping to look. As a result of the findings, safer stopping conditions and interpretation were provided by the park.

Jim Rouse is eyeball-deep in the usual problems of maintenance and safety, but he is aware of the information now available to him about how he can improve visitor experience of the lake as opportunities to do so arise.

"We now have the information we need in order to make changes for the better," he said. "And beyond that, the surveys and observations made by Shelby and Wolf give us some pretty compelling reasons for changing."

Crowded Rim: Crater Lake visitors settle for less than the superb experience Crater Lake can offer.



Giardiasis Confirmed At Olympic NP

In response to the confirmed presence in Olympic NP of *Giardia lamblia*, the organism that causes giardiasis in mammals, an information synthesis on the subject has been prepared by Research Biologist Richard Starr of Olympic. A condensed version follows.

Biology: *Giardia lamblia* is a flagellated protozoan infecting the upper part of the small intestine and may parasitize virtually any mammal. It has two life cycle phases – a trophozoite or active stage and an infective stage, consisting of cysts which are passed in the feces of infected animals. The cysts may remain viable for up to three months even in very cold water. Upon ingestion, they hatch out into trophozoites, which attach themselves to the intestinal walls.

Transmission and Vectors: *Giardia* has worldwide distribution. The disease giardiasis is most commonly contracted from drinking water contaminated with fecal materials. In the backcountry, it may be carried by any mammal, but aquatic mammals such as beaver and muskrat are the most important vectors. Slight evidence also points to river otters.

Giardiasis has been confirmed at Ozette and is strongly suspected in the Hoh area and all westside valleys of Olympic NP. Outside, it has been found at the Clearwater Corrections Center and near the Snyder work camp, where a drinking water tank for a work crew was filled from a beaver pond.

All low to middle elevation areas in the western and northern parts of the peninsula are suspect, particularly where aquatic mammals are present. Eastern and southern peninsula have not yet had reported incidents. Subalpine and alpine areas are least likely to be contaminated, but there is no guaranty.

Symptoms: Many cases of giardiasis, perhaps the majority, are without symptoms, and acquired immunity is a possibility. Most common symptom is explosive, foul diarrhea, or less commonly, loose, mushy stools; the stools often are greasy due to malabsorption of fats in the diet. Other major symptoms include extreme flatulence accompanied by abdominal distention and pain, loss of appetite and weight loss. Less commonly occurring symptoms are nausea and vomiting, belching foul gas, headache, chills and low fever.

Diagnosis: Diagnosis is most common by detection of cysts in stool samples – a method not always effective. The cysts appear to be released on a periodic, cyclical basis rather than steadily, so that a given specimen may not contain cysts even though the disease is present. Another diagnostic method involves swallowing a capsule affixed to a length of string and retraction through the mouth (an uncom-

fortable process), after which the string is scraped for microscopic examination. This method also is not 100 percent effective. Most effective is examination of a biopsy from the upper small intestine for trophozoites.

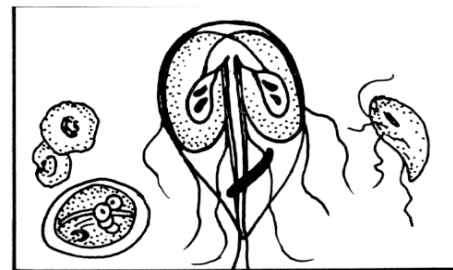
Treatment: Simple, effective treatment involves medications such as quinacrine hydrochloride (Atabrine), metronidazole (Flagyl) and furazolidone.

Prevention: *Giardia* infection may be prevented either by removal of the cysts from drinking water, or by their destruction. Appropriate filters for removing cysts rarely are available in the backcountry. Heat is the only 100 percent sure method of destroying the cysts. All cysts will be killed at 140°–160° but bringing water to a boil will guarantee its being cyst-free. It is not necessary to boil the water for any length of time. The evening meal is a good time to boil the next day's drinking water.

A number of chemical methods are available for purification of drinking water. They include halizone (5 tablets per liter for 30 minutes), bleach (0.2ml, or 4 drops, per liter for 30 minutes in cloudy water and 0.1ml, or 2 drops, per liter for 30 minutes in clear water; globaline (tetraglycine hydroperiodide; e.g. army surplus iodine water purification tablets, 2 tablets per liter for 20 minutes in cloudy water and 1 tablet per liter for 20 minutes in clear water; emergency drinking water germicidal tablets (tetraglycine hydroperiodide slightly stronger than globaline, e.g., Potable Aqua (2 tablets per liter for 20 minutes for all water; iodine (2% tincture), 0.5ml, or 10 drops, per liter for 30 minutes in all water; and iodine (saturated), which involves placing a few grams of iodine crystals in a small bottle and filling with water. After a few minutes, with occasional shaking, the supernatant solution can be used as a purifying agent. The iodine crystals may be used repeatedly.

For fuller discussion of these purification methods, see Jarroll, E.L. Jr., A.K. Bingham, and E.A. Meyer. 190 *Giardia* cyst destruction: Effectiveness of six small-quantity water disinfection methods. *Am. J. Trop. Med. Hyg.* 9:8-11.

The complete paper may be requested from the author at Olympic NP, 600 E. Park Ave., Port Angeles, WA 98362. Information sources for the paper are Edwin C. Lippy, Health Effects Research Lab, U.S. Environmental Protection Agency, 26 St. Clair St., Cincinnati, Ohio 45268 (8-684-7226) and Karen Fukutaki, research microbiologist, State Dept. of Social and Health Services, Floor 13, Smith Tower, Seattle, WA 98104.



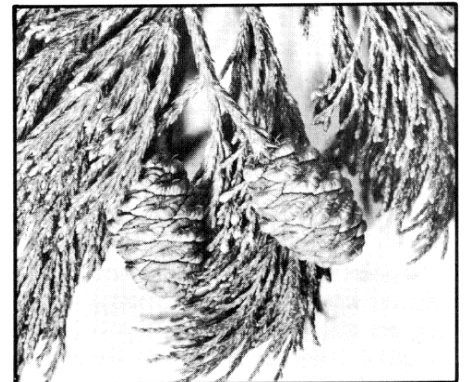
Book Review

Sequoia Ecology: Fire and Reproduction

Reviewed by David J. Parsons, Research Scientist, Sequoia and Kings Canyon NPs.

Sequoia Ecology: Fire and Reproduction, by H. Thomas Harvey, Howard S. Shellhammer and Ronald E. Stecker. 1980 U.S. Department of Interior, National Park Service, Washington, D.C. 182 pages.

This book is the twelfth volume to be published in the National Park Service's Scientific Monograph Series. It represents the product of over 12 years of scientific investigation into the role of fire, insects and small mammals in the reproduction and survival of the giant sequoia (*Sequoiadendron giganteum*). The giant sequoia is a relict species now found only in isolated distinct groves on the western slope of the Sierra Nevada. It is well adapted to periodic fire



Foliage and cones of the giant sequoia. Fire, the Douglas squirrel and a cerambycid beetle and moth all contribute to successful spread of the seeds.

by means of a thick fire resistant bark, a lack of lower limbs on mature trees and the beneficial role of fire in promoting reproduction.

The authors provide considerable quantitative data on two primary reproductive strategies. In the first, periodic fire heats and opens the serotinous cones providing an abundant source of seeds. The seeds fall on mineral soil where they have an increased chance of germinating. At the same time several factors provide for nearly continuous release of lesser numbers of seeds. The Douglas squirrel, a cerambycid beetle and a moth all attack sequoia cones, partitioning the resource along a cone age axis. This causes a drying or disintegration of the cones and subsequent gradual seed release. Most such seeds fall on litter or duff on which they desiccate before germinating. Occasionally flooding or the failure of a large tree may open up a suitable mineral soil substrate to allow germination. Once germinated, sequoia seedlings still face severe stress from shade, desiccation and predation. Of course when a tree lives to several thousand years in age it does not need to reproduce successfully very often.

Among the many interesting facts presented in this book are data on the average number of cones per tree (14,000), seeds per cone (200) and seeds produced annually per hectare (1,590,000). Through the use of an elevator, rigged after climbing an adjacent tree, Ron Stecker was able to investigate carefully the insects utilizing the crown of a 290 foot tall sequoia. He increased the known number of insects using giant sequoias as a host during some part of their life cycle from 20 to 143.

While the book presents considerable data from detailed experiments, the data are not always easy to extract. In addition to a poor job of printing, the organization within many of the chapters could be improved considerably. Similarly the overall design of the study as well as the detailed methods are not always clear or do not always relate well to the results. The discussion sections all too often repeat the results without adequately discussing their significance. While such deficiencies could have benefited greatly from a professional editing they should not detract from the value of the data presented to park managers and interpreters.

Among their numerous conclusions the authors

Plant Restoration At John Day Studied

Richard Miller of the Oregon State University rangeland resources program, has completed the first year of a two-year study at John Day Fossil Beds NM aimed at reestablishment of native vegetation. Prior to establishment of the Monument, the area was heavily grazed by domestic livestock, and numerous exotic species such as cheatgrass and russian thistle were introduced. Miller hopes to determine practical methods for reducing competition from exotics and returning the area to its earlier plant populations. A final report is expected by January 1, 1982. For Further informaton contact Miller at (503) 754-3341 or Supt. Ben Ladd at (503) 525-0721.

emphasize the important role fire plays in perpetuating the species and the need to remove concentrated human activity from the sequoia groves.



Some lodgepole pines retain seed inside resin-coated cones until a fire passes, killing the tree and opening the cones. Seeds fall onto nutrient-rich ash, resulting in a new generation of lodgepole pine. This adaptive mechanism is the result of evolution in an environment where fire has been present for many thousands of years.

Meetings and Symposia

"Dynamics and Mangement of Mediterranean-type Ecosystems" is the topic of an international symposium slated for June 22-26 at San Diego State University in California, with the National Park Service as a co-sponsor. Dave Parsons, Sequoia-Kings Canyon NP research scientist, who is serving on the technical committee, describes the symposium as "a major effort to draw managers and scientists together to discuss the latest information on this important subject." Sessions will be of interest and value to wildland managers, researchers, and others concerned with management of the brushlands of California and the southwestern U.S., the Mediterranean Basin, central Chile, southern Australia, and southern Africa. Attendees are invited to ask questions and contribute information, during discussion periods and throughout the symposium as well.

John Oakes, former editor of the *New York Times* and one of the founders of the Natural Resources Defense Council, has long held that the environmental movement needed a strong economic leg if it is to stand alone and eventually make headway. A step in this direction is being taken this spring at the University of Louisville in Kentucky, where economists, ecologists and systems analysts will gather April 20-23 under the sponsorship of the International Society for Ecological Modeling. Featured speakers will include Ilya Prigogine, Nobel prize-winning chemist, economist Ken Boulding, mathematician Bernie Patton, systems ecologist H.T. Odum, ISEM President Sven Jorgensen, and James

Grier Miller, author of the monumental "Living Systems." The implications for management of park areas could be profound when ecological and economic factors can be combined in one predictive model.

Dave Butts, NPS chief of fire management, stationed at Boise Interagency Fire Center, delivered a paper on fire and insect outbreaks in the national parks at the December 1980 meeting of Western Forestry and Conservation Association in Victoria, B.C. He pointed out the strong park parallel with National Forest System wilderness area management with particular attention to the increasing "island" effect produced in natural areas by intensifying development of all kinds on surrounding lands—both private and public.

The paper outlines pest and fire management theory (based on NPS "Management Policies, 1978") and then reviews actual practices, using Everglades, Big Thicket, Rocky Mountain, Grand Teton and Yellowstone NPs as examples of the wide variety of ecosystems and impinging conditions to be dealt with. The wind-up deals with specifics of Glacier NP, its current outbreak of Mountain Pine beetle, and the impossible implications of prescribed natural fire and prescribed burning.

In essence, the paper describes the NPS as conducting a "real world" program in regard to pests and fire. "It is not just 'No Action'," Butts maintains. "The underlying rationale is one of ecologically sensitive management."

Look What We're Doing!

FIRE in the Pacific Northwest National Parks is the title of a visitor-oriented brochure to be published this spring with park, regional and CPSU funds for distribution at the four parks mentioned — Crater Lake, Mount Rainier, Olympic and North Cascades. Jim Agee, research biologist with the University of Washington CPSU, saw a chance to better prepare visitors to enjoy the parks, to handle backcountry challenges, and to understand park fire management policies. He directed the project; Denison M. Rauw prepared the text, Phyllis Wood the graphics, and Nadyne Snyder the layout and type design. One page is reproduced here.

Agee also has three recent research papers out: "Issues and Impacts of Redwood NP Expansion" appeared in *Environmental Management*, 4 (5), pp. 407-423, and two papers on fire in the Olympic mountains have been published in the *Proceedings of the Sixth Meteorology Conference*, April 22-24, 1980 in Seattle. The redwood article traces the evolution of Redwood NP from its state park roots in

Look What We're Doing!

1901 through the controversy and compromise that have marked its lumbering progress to national park status, with particular attention to the precedent setting legislation that provides direct mitigation for local economic impacts.

The Proceedings papers are entitled "Characteristics of Large Lightning Fires in the Olympic Mountains, Washington," and "First Year Ecological Effects of the Hoh Fire, Olympic Mountains, Washington." Mark Huff co-authored both papers and all three are available from Agee (Dr. James K.) at the NPS/CPSU, College of Forest Resources, University of Washington, Seattle, WA 98195.

"Scientific Research in Sequoia and Kings Canyon NPs: An Annotated Bibliography," is the title of a recent report that culminates years of research. By David J. Parsons and Virginia V. King, it is a completely annotated listing of research studies carried out in Sequoia and Kings Canyon, and already has proven of great value to scientists, students and managers interested in Sierra Nevada. It covers a variety of subject matters (climate and weather, culture and history, entomology, pathology and pollution damage, fire ecology, fisheries and aquatic biology, geology and soils, vegetation, wilderness use and impact, wildlife, author index) and is available from Research Scientist's Office, Sequoia and Kings Canyon NP, Three Rivers, CA 93271.

Gary Machlis of the University of Idaho CPSU, together with William J. McLaughlin and Liu Yu-Lian, wrote the feature article for the July 1981 issue of *Parks and Recreation* - "An Urban Park in China: Xuan Wu Hu." (See Gary's China Trip story on page 5). The *P&R* article discusses a conceptual framework for examining urban parks, looks at the relationship of Xuan Wu Hu to the city of Nanjing, the region and China, profiles the various functions of the park - its role in the economic, environmental and social aspects of the city, and describes how the multiple uses of the park are integrated within the park and with the city. A final section deals with implications for American park management.

Gary Davis, marine biologist with the Western Region, was just getting his feet wet in the Pacific Ocean around Channel Islands NP when two of his publications from Everglades (former station) caught up with him. "Spiny Lobster Series," organized and coordinated by Davis, is a series of papers representing a diverse array of disciplines from biochemical genetics to ecology and economics, contributed by members of two federal agencies (NPS and National Marine Fisheries Service), a state agency (Florida Dept. of Natural Resources), a public university (U. of Florida), a private university (Nova), and a private company (Science Applications, Inc.) The series was published in *Fisheries* 5 (4), pp. 27-62, and is available in reprint from American Fisheries Society, 5410 Grosvenor Lane, Bethesda, Md. 20014. Also available in reprint form is Davis's "Changes in the Everglades NP Red Drum and Spotted Seatrout Fisheries

1958-1978: Fishing Pressure, Environmental Stress, or Natural Cycles?" from *Proceedings of the Red Drum and Seatrout Colloquium*, Oct. 19-20, 1978, 81-87. Copies of the reprints may be had from Davis, Channel Islands NP, 1699 Anchors Way Dr., Ventura, CA 93003.

"Kelp Beds and Sea Otters: An Experimental Approach," by David O. Duggins, published in *Ecology* 61 (3), 1980, pp. 447-453, documents the rapid and dramatic increase in kelp biomass following the return of sea otters to shallow subtidal communities where sea urchins had been consuming most of the macroscopic algae. Sea otters, keystone predators, clearly mediate major changes in nearshore marine communities at several trophic levels; their near extinction "must have resulted in a major environmental modification of over 6000 km of coastline; so will their reintroduction," Duggins found. "The management of otter populations by man has widespread implications to marine communities and requires careful execution." The research was done under NPS contract; Duggins is stationed at University of Washington's Friday Harbor Marine Lab, Friday Harbor, WA 98250.

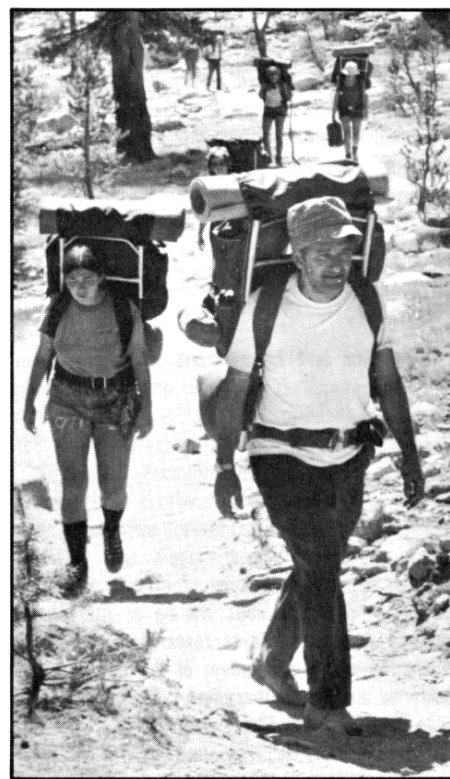
"Weather, Fuel, and Lightning Fires in Olympic National Park," by S.G. Pickford, G.R. Fahnestock and R. Ottmar, was published in *Northwest Science* Vol. 54, No. 2, 1980, pp. 92-105. The paper presents the major findings of a study contracted for in 1976 by the NPS Pacific Northwest Region on the fire potential within Olympic NP. The study covers 60 years, from 1916 to 1975, and finds that lightning fires, four fifths of them above the 915-meter level, accounted for most of the 2,502 hectares burned. Detailed report is on file at Olympic NP headquarters in Port Angeles, and at the College of Forest Resources, University of Washington, Seattle 98195.

"The Intertidal Life of Bartlett Cove" is the title of an illustrated, information-packed publication produced through joint efforts of the University of Washington CPSU and the Pacific Northwest Region's division of interpretation. David Duggins and James Quinn wrote the text and Cathy Eaton provided the illustrations. J.A. "Rocky" Richardson coordinated the project, which uses the results of research study in a manner easily understood by visitors. Many of the organisms described can also be found as far south as California and, as the authors note, "what we have learned by observing intertidal animals in Bartlett Cove can be applied to other areas of the northwest Pacific Coast." The booklet is available as a public service from the Superintendent, Glacier Bay NM, Box 1089, Juneau, AK 99801.

Jan van Wagtenonk, research scientist, and Jim Benedict, research assistant, both stationed at Yosemite NP, are co-authors of two journal articles dealing with wilderness visitor behavior - "Travel Time Variation on Backcountry Trails" in *Journal of Leisure Research*, 1980, Vol. 12, No. 2, pp. 99-104, published by the National Recreation and Park Assn.,

and "Wilderness Permit Compliance and Validity" in *Journal of Forestry*, July 1980, pp. 399-401. Benedict took a strategic "next step" toward getting some of these findings to the public when he wrote a popularized version for *Backpacker*. It appeared in the August/September 1980 issue, p. 40, under the inspired title "Shouldn't We Be There By Now?"

A 28-page final report on calendar year 1980 appeared in January by the Biology and Resource Management Program, Alaska CPSU, University of Alaska, Fairbanks, AK 99701. Prepared by Project Leader Frederick Dean and Candy Anderson, the report covers personnel, funding, meetings, publications, final reports, and summaries of research projects at Glacier Bay, Mount McKinley, Kenai Fjords and miscellaneous projects.



Traveltime Variation on backcountry trails.

SERO Science Brochure

A public information brochure, "Science in the National Park System, Southeast Region," has been produced for approximately 6 cents each and is being used as a handout to interested researchers from other federal and state agencies, universities, private institutions and conservation groups. Composed and produced by Writer/Editor Jim Wood, the brochure describes the NPS mission, the need for research to fulfill that mission, and the three-faceted science program - extension, research, and monitoring.

INFORMATION CROSSFILE

TIPS For Forest Photographers is the name of an excellent book of guidelines for field photographers. Content, perspective, points of interest, action — everything (well, lots of things, anyway) you need to know in order to "capture a moment in time" and make it live again — all are covered in this splendid little publication. Newsletters like **Pacific Park Science** are intensely interested in getting researchers to start taking black and white photos **as they do research** — the better to make explicit for the non-expert the implicit usefulness of the findings. Information on this free booklet, by R.W. Neelands, may be had by writing the U.S. Forest Service, 1720 Peachtree Road, N.W., Atlanta, GA 30309.

RESEARCH, a magazine of scholarship for the lay reader, burst on the Fall 1980 scene with an outstanding preview issue. In full color, with thoughtful layout and spectacular graphics, the magazine is contemplated as a quarterly and "subscriptions and additional copies are provided and available without charge." The preview issue deals with genetic transfer of growth instructions, computer chemistry, the "invisible" role of women in shaping history, an electrical and chemical look at nerve processes, the dismal failure of the dismal science (economics), and moral standards as they apply to big government, big universities and big business. Eighteen book reviews are contained in a "Sampler of Scholarship" section, and a sample of the liberal sprinkling of cartoons is here reproduced. For copies, write to William R. Kell, editor; 101 Pleasant St., S.E., Room 417, Minneapolis, MN 55455.

WESTERN FORESTER, issued nine months a year, September through May, by the Society of American Foresters, features a front page story on Chinese foresters visiting the Pacific Northwest in its November 1980 issue. The seven professional foresters represented the Chinese Society of Foresters and were the China portion of an exchange of visits that saw a similar group from SAF touring China earlier in 1980. Dean of Forestry Carl Stoltenberg at Oregon State University hosted the group for two days in Corvallis and in the field for a look at harvesting methods; banquets and receptions were held in Portland and Seattle and a day-long trip to Mt. St. Helens featured an early morning flight around the mountain and four hours of viewing the devastation in the Red Zone. Merle S. Lowden is managing editor of *Western Forester*, with headquarters at 1326 American Bank Bldg., Portland, OR 97205; (503) 224-8046.

SCIENTIFIC AMERICAN, January 1981, carries two articles of interest to certain NPS personnel. One "The Wild Gene Resources of Wheat" supports the importance of gene pool preservation, a prime function of world biosphere reserves (20 of which are located within U.S. national parks). The other (a Science and the Citizen note) details the methodology by which China's Sichuan province is massively converting to biogas as a major source of energy.

In the wild wheat gene article (p. 102), Moshe Feldman and Ernest R. Sears, note that failure to conserve the primitive cultivated varieties of wheat already has resulted in loss of a substantial reserve of genetic variability, and conclude that "the restoration and enrichment of the gene pool of the cultivated wheats can be accomplished only by tapping the vast genetic resources that are to be found

in the wild relatives of the wheats." A major publication, "The Value of Conservation of Genetic Resources," by Margery Oldfield, under NPS contract, is slated for eventual publication by NPS/WASO. It will cover use and preservation of genetic resources as two inextricably interrelated human activities.

Also described in an SA newsnote is a "digerster" that produces a clean-burning gas, one half to three fourths methane, that could make economic and ecologic sense in conjunction with the solar privies now a working part of the backcountry scene in several NPS areas (see Dec. 1980 *Courier*, p. 5). In China the gas is used for burners, lamps, pumps and motors, and experiments are in progress toward converting the gas into a fuel to power small tractors. It costs \$14 for supplies to build a 10 cubic meter cylinder. For a detailed description of how to build the digester, including adaptations for different soil conditions, see "Translation of a Bio-gas Manual," 1979, 160 pp., \$8.75, distributed for a British publishing company by I.T.G. (914) 271-6500.

EARTHWATCH is both a publication and a tax-exempt public charity, now 10 years old, that every year recruits 1400 volunteers to work with scientists in 40 countries. In its Winter-Spring 1980 issue, *Earthwatch* describes two team research projects that took place in August and December 1980, with Charles van Riper III, on leave from the University of California, Davis CPSU, as leader. Earthwatch volunteers become acting team members and research assistants and share part of the costs of the research projects that engage them. Earthwatch may be contacted at 10 Juniper Road, Box 127, Belmont, MA 02178; (617) 489-3030.

FORESTRY RESEARCH WEST, in its November 1980 issue puts its elegant editorial finger on what *Pacific Park Science* is all about — technology transfer. In an article by Delpha Noble of the Inter-mountain Forest and Range Experiment Station in Ogden, UT (84401), technology transfer is defined as "a continuous process with live circuits." Noble describes the dilemma faced by managers of Batholith lands, pressured by various interest groups to use the valuable resources, and yet "well aware of the impacts of logging and road construction, and of the consequences that can result from improper land use practices." Seventeen different studies are being conducted under these major headings: engineering, wildlife, soils, hydrology, entomology, ecology and aesthetics. Noble points out that "as various studies are completed, the results are published for immediate application by land managers, and nine recent publications stemming from the Silver Creek program are listed. The publication is available free; the address is 240 W. Prospect St., Fort Collins, CO 80526.

"OKAY, LET'S SEE
NOW. WE'VE GOT
TWO UNDER
TOWNSEND,
TWO UNDER
BAILEY,
AND THE
REST OF YOU ARE
HERE IN THE NAME OF
SCIENCE."



INFORMATION CROSSFILE

SCIENCE RECORD, a quarterly published by the College of Science, Oregon State University, Corvallis, OR 97331, carries in its Fall 1980 issue an account of Mount St. Helens investigations of Dr. Charles Rosenfeld, OSU geomorphologist. He has been flying National Guard reconnaissance missions in the Cascades since 1975 as part of a monitoring study with the U.S. Geological Survey. The project was designed to observe heat output of the Cascades volcanoes. Radar was used to pierce the plume during the March eruption and see what was happening inside the crater. Dr. Rosenfeld's efforts now are directed toward understanding how the land will recover from such a catastrophic impact. In this "natural laboratory" just 150 miles from his office, he can now observe how hillslopes and drainage basins recover, and perhaps "formulate helpful recommendations for those people who must decide about reestablishing roads, salvaging timber, managing forests and fish habitats."

"The Valuation of Outdoor Recreation in a Multiple-Use Forest" is the title of Research Bulletin 28 by Kenneth C. Gibbs, Lewis Queirolo and Craig Lomnicki of Oregon State University's Forestry School at Corvallis, 97331. Although it appeared in November 1979, the bulletin presents a methodology whose usefulness to forest land managers is as current as today. Basically, the study presents economics as a powerful decision-making tool. Although the study results are unique to the resource base analyzed (northwest Oregon state forest lands), the procedures employed, the type of data required, and the kinds of answers the technique can provide are readily adaptable to different situations by changing the model's assumptions to reflect these other conditions.

The August 1980 issue of *Journal of Forestry* carried another Gibbs article, this one on **"Public Campgrounds: Are They Profitable?"** A detailed cost analysis on 111 USDA Forest Service campgrounds in the Pacific Northwest showed costs from 28 cents to \$3.01 per recreation visitor day, depending on the level of campground development; revenues ranged from 0 to 27 cents per day. Current camper subsidies amount to \$12 million in taxes annually in this region alone — from \$2.07 to \$22.27 per average family (3.7 people per 24 hours).

OREGON WILDLIFE, in its December 1980 issue, examines the Salmonid Enhancement Program (SEPI) in British Columbia in comparison to Oregon's proposed STEP (Salmon Trout Enhancement Program) — a proposal awaiting legislative action in the 1981 session. Oregon's STEP is comparable to the public involvement portion of SEP, the other portions of SEP such as hatcheries and stream clearance being covered in the regular Oregon fisheries budget. Installation of streamside incubation facilities to hatch

salmon eggs, while failing to produce increased numbers of fish coming back into B.C. streams, has had a thought-provoking side effect. "The citizens who have been handling the eggs have now become involved in looking at their streams and in examining what has been happening to the habitat," writes author Ron Shay. "Folks who are trying to hatch eggs become extremely irate if a great gob of silt from roadbuilding smothers their eggs. Basically a new awareness has evolved ... It has been estimated that 85 percent of the value of the public involvement portion of the SEP program is its creation of public concern." The article deals with "an impossible management situation — high productivity through enhancement and low productivity because we're wiping out or lowering the natural shock" at the same time. One year earlier, an article by Harry Wagner entitled "Why the Wild Coho" made the December 1979 issue of *Oregon Wildlife* much sought after by resource managers. That article covers laws and policy, culture and aesthetics, economics and biology, and states categorically that "wild coho are more diverse genetically and are better adapted — more fit for survival, growth and reproduction in the stream and ocean — than are the progeny of hatchery fish." *Oregon Wildlife* is published monthly and circulated free; write Oregon Wildlife, P.O. Box 3503, Portland, OR 97208.

WESTERN FISHERIES is a Special Interest Publication of Maclean Hunter, Ltd., and carries similar kinds of articles. Their address is No. 202-1132 Hamilton St., Vancouver, B.C. V6B-2S2.

CORVALLIS GAZETTE-TIMES reported Jan. 7, 1981, that Audobon officials took a page from the National Park Service book when a rare burrowing owl was shot and hung on a fence in western Linn county. Audobon Society board members are setting up a reward fund, to operate like the fund set up several years ago when a rare bighorn sheep was killed at Lava Beds NM just south of Klamath Falls, Oregon. The fund would be used to pay rewards to persons who give law enforcement officials information leading to arrests and prosecutions of those responsible for shooting non-game birds and mammals protected by state and federal laws.

LOG STRUCTURES, Preservation and Problem-Solving is the title of a 120-page paperback, full of detailed instructions for dealing with wood decay, loose chinking, leaking roofs and sagging floors — all the difficulties inherent in log structures. Ninety-three photos and 57 diagrams illustrate each step in precise, do-able fashion. The book is \$8.25 for members of the American Association for State and Local History, \$10.95 to others, and can be ordered from the AASLH, 1400 Eighth Ave., S., Nashville, TE 37203.

Reviews of three books dealing directly with National Parks are contained in the December 1980 issue of *Living Wilderness*, published quarterly by The Wilderness Society, 1901 Pennsylvania Ave., N.W., Washington, D.C. 20006. *National Parks: The American Experience*, by Alfred Runte (Lincoln, Neb., University of Nebraska Press, 1979, 240 pp., illus. \$16.50) is reviewed by William C. Everhart and considers the question "How altruistic was the creation of our parks?" Preserving nature at the Golden Gate is the subject of *San Francisco's Wilderness Next Door* by John Hart with black and white photographs by Robert Sena and foreword by Cecil D. Andrus (San Rafael, CA: Presidio Press, 1979, 160 pp., illus. \$9.95 paper), and it is reviewed by Harold Gilliam. *Mountains Without Handrails*, the third book, is subtitled "Reflections on the National Parks" and is by Joseph L. Sax (Ann Arbor: University of Michigan Press, 1980. 152 pp., \$10 cloth, \$5.95 paper). Ron Tipton, the reviewer, calls the book "an excellent statement of The Wilderness Society's basic philosophy regarding the management of our national parks."

TVA's 1979 ANNUAL REPORT is a landmark publication from the standpoint of honesty in addressing all sides of such tough issues as nuclear energy, pesticides, forest and wildlife management practices, coal mining, and the disposal of hazardous wastes. The Report's seven chapters are entitled energy, nuclear safety, environment, agriculture, land use, recreation, and economic development. Full color graphics lend visual urgency to the Report's powerful prose. Editor is Bill Sims. The popular version is \$1; write to the Treasurer, Tennessee Valley Authority, Knoxville, TN 37902. Volume II of the Report includes financial and statistical information and costs \$2.

Research Umbrella Covers DI and DA

A memorandum of understanding between the Departments of Interior and Agriculture, signed on Dec. 29, 1980, establishes an umbrella under which seven specified bureaus (NPS, FWS and BLM from DI and four forest and soil agencies from DA) will cooperate in the conduct of research programs. Al Greene of the WASO science and technology division will coordinate implementation and should be kept informed of all such regional interagency research.



Vignettes

One of the most significant dilemmas for NP management revolves around the idea of parks as "vignettes of primitive America." Central to the dilemma is the fact that there is no such thing as "a fixed world." The nearest that management can come to the vignette idea is not reintroduction of conditions that may have held sway at some arbitrarily chosen time in the past, but rather the perpetuation of the processes that represent "how it would look if Europeans had not showed up."

Everyone knows that weather changes from day to day and season to season. Less well understood, even by scientists in the field, is the profound changes in climate and all attendant conditions that may stem from such phenomena as the 11-year sun spot cycle and the 22-year Hale cycle (in which the complex magnetic fields of the sun return to their starting polarity.)

A recent article by Walter Sullivan of the *New York Times* describes intensive tree ring work being led by Dr. Charles W. Stockton at the University of Arizona, seeking to define the likelihood of prolonged and extreme drought for each of nine river basins in the Western states. In assessing the impact of such a drought, researchers are looking for signs of extraordinary deviations from normal climatic behavior. They have examined the resiliency of each watershed in situations of curbed water flow and have found the Colorado River system to be "by far the most vulnerable."

Cores so far collected in the more western of the states under study reach back to 1600. The information about conditions that prevailed over the past 400 years could be useful to park management in determining how natural park areas would look today if human intervention had not occurred (Scientists and managers are working together to achieve park specific prescriptions for restoring "historic" vegetation sequences.)

Additionally, the vulnerability of the Colorado River system and its increasing overexploitation sets up warning signals for national park managers. In the words of Dr. Stockton, "There is going to be a day of reckoning." Just how interested the public may be in vignettes of primitive America when the human water supply for whole regions is affected remains to be seen. Meanwhile, the most scientific and enlightened management of natural parks can contribute to the public understanding and valuation of natural park areas in the overall ecological scheme of things.

SUPERINTENDENTS' CORNER

From Herbert S. Cables, Jr., Superintendent of Gateway NRA.

I read the first issue of Pacific Park Science and found it to be a most important effort. I was especially interested because the interwoven responses of many different scientific disciplines are at the foundation of Gateway NRA and undergird our master plan. The accumulated scientific information about our vanishing local natural resources, impacted by urban sprawl and unplanned development, provided the framework for creation of that plan.

Management decisions need a catalyst — in the form of knowledgeable individuals responsible for implementation of monitoring, data collection and interpretation, and sound resource protection recommendations. Few NPS Regions, let alone parks, have such diversified expertise on their staffs. Here at Gateway in our early development stages, it was the Cooperative Park Studies Unit concept and the concrete help from CPSU's such as those at C.U.N.Y. and Rutgers University that helped provide much of the information for basing management decisions.

In a recent paper, written with Natural Resources Management Specialist John Tanacredi, (to be reviewed in the spring issue), I discussed our coastal management policy emphasis here at Gateway, covering several management scenarios. Without creditable and supportive scientific information, we could have taken actions that would have incurred irreversible long-term impacts on both natural and cultural resources. My own feeling is that it is not merely a matter of "more or less" science today, but instead a sense of "application" . . . applying all available scientific resources to specific management problems in order to best serve the parks in our care and the people who enjoy them. I look forward to greater emphasis in the CPSU activities at Gateway.

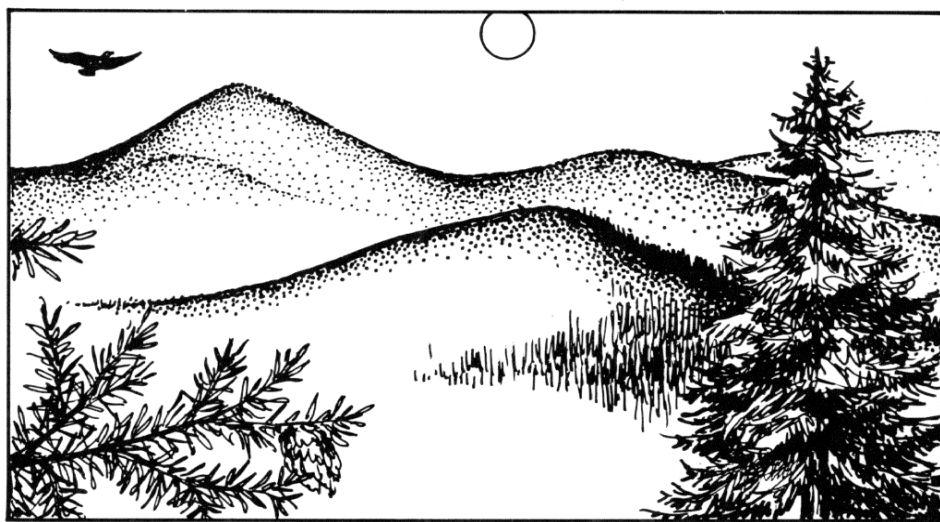
From Rodd L. Wheaton, Supervisory Historical Architect, Rocky Mountain Regional Office

This office read with interest Vol. 1 No. 1 of PPS; the Historic Preservation Staff was particularly interested in the Superintendents' Corner. We have been involved in log preservation research in this Region for several years and are actively using epoxy consolidation and patching techniques as an alternative to fungicides which we are viewing as not being environmentally safe.

Epoxy research, conducted by Dr. Harrison Goodall and Renee Friedman, has provided for a substantial savings in log structure stabilization projects and has proven effective in dealing with some surface decay. However, as a qualification, we are viewing epoxy systems as basically a stop-gap measure where decay is retarded and the log is protected for a few more years. Eventually these logs too will need to be replaced. (See information crossfile.)

From Don Brown, Superintendent, Isle Royale NP

We were extremely pleased to see the first issue of Pacific Park Science. It is timely that such a publication is now available, given the necessity for research and resources management in the parks. The format is well suited to this type of publication in that the technical information is put forth in a readable manner, yet without the loss of content. We suggest that you continue to leave out the strictly technical aspects. In this light please continue to give citations/references as to where copies of an author's formal research publication on a particular topic may be obtained. We wish you well in the publication of subsequent issues.



HERE is what we HEAR

PPS Feedback — Reaction was strong and generous following distribution of our first issue. We heard a couple of grumbles second and third hand, and took careful note, but you'll have to send them in writing or we can't print them. Here's what we did get:

"I am a NPS employee and recently read the first issue of *PPS* with great interest. I am wholeheartedly supportive of your efforts to stimulate an exchange of scientific information. My only regret is that your emphasis is regional rather than national. The Service is in desperate need of improved research and technology. I have enclosed a list of addresses of the USFS Forest and Range Experiment Stations and the USFS Equipment Development Centers. They all maintain mailing lists for bulletins of their recent publications and information on their work, all free. It might be worthwhile running a short item to this effect in your next issue. I honestly wonder how many NPS managers are aware of the existence of these research units, let alone the information they can provide." Signed Gordon Olson, Hagerstown, MD.

(Editor's note: You bet it's worthwhile, and here is the list.)

Missoula Equipment Development Center, Ft. Missoula, MT 59801; San Dimas Equipment Development Center, 444 E. Monita Ave., San Dimas, CA 91773; Pacific Northwest Forest and Range Experiment Station, 809 N.E. Sixth Ave., Portland, OR 97208; Pacific Southwest F&RES, 1960 Addison St., Berkeley, CA 94701; Intermountain F&RES, 507 25th St., Ogden, UT 84401; North Central F&RES, Folwell Ave., St. Paul, MN 55101; Northeastern F&RES, 6816 Market St., Upper Darby, PA 19082; Southern F&RES, Federal Bldg., 701 Loyola Ave., New Orleans, LA 70113; and Southeastern F&RES, Post Office Bldg., Asheville, NC 28802.

On Dinosaurs — Ted Fremd, paleontologist at Fossil Butte NM and Dan Chure, paleontologist at Dinosaur NM, write: "We read with interest your report of the first discovery of iguanodon dinosaurs from Germany (*Pacific Park Science* 1(1):12), but found the note potentially misleading. The impression given is that these dinosaurs are found in rocks of the Devon formation — over 300 million years old, the implication being that these creatures were alive 300 million years ago. Iguanodons are generally Wealden (Cretaceous) in age (115-135 million years old), and thus the reported age of the German iguanodons would be surprisingly old. In fact, this would make these relatively advanced dinosaurs the oldest known dinosaurs by some 80+ million years. In addition, they would be the only dinosaurs

discovered from the Paleozoic Era, and this would be quite a scientific find.

While not directly familiar with the geology of the discoveries in Germany, we believe that an examination of another Iguanodon discovery can clear up some of the confusion concerning age. At Bernissart, Belgium, some 30+ individuals of Iguanodon were discovered in the late 1880s. The geology of this site shows that these beasts are preserved in a filled-in valley. This valley existed in the Cretaceous (Wealden), but was carved into rocks some 300 million years old. Thus the dinosaurs and the sediments that ultimately filled in this valley are about 120 million years old, NOT 300 million years old. The rock pocket reported in your note is probably a valley or fissure like the one mentioned above, and the iguanodonts are most likely Cretaceous in age and not the age of the Devon Formation. Claims of 300 million year old dinosaurs do not seem warranted at this time."

"Just a short note to tell you how much I enjoyed the first issue of *Pacific Park Science* which just passed across my desk, and to be sure to get my name on the mailing list. It's very valuable for me in terms of 'catching up' on what is going on around the Region, and learning the availability of publications. The graphics and layout are particularly eye-catching, and the format utilized would seem to aid in effectively transferring scientific results." Signed Barbara Koth, Research Associate, University of Washington, Seattle.

"Vol. 1 No. 1 of *PPS* looked good to me, except that some of the bear drawings seemed a little cute. Also I don't like the thick black border around many of the drawings — reminded me of an obituary column. These are minor points, and on the whole I was quite pleased." Signed Doug Houston, Research Scientist, Olympics NP.

"I think that Volume 1 No. 1 of *PPS* was excellent. The job was outstanding and deserve commendation all around. I look forward to future issues." Signed Denny Fenn, Regional chief scientist, Western Region.

"I recently read the first issue of your magazine *Pacific Park Science* and enjoyed it very much. Please add my name to your mailing list." Signed Randall Fong, NPS, Denver Service Center.

"Super publication! Please add me to your list." Signed Charles A. Salkin, Delaware Division of Parks and Recreation, Dover.

"I have just received and am impressed by the Fall 1980 issue of *Pacific Park Science*. As a result I am very interested in receiving future copies of this publication. I am transferring from the Denver Service Center to Grand Canyon NP in January 1981 as Chief, Division of Resources Management. To insure I do not miss future issues, please add my name and the Grand Canyon address to your mailing list," Signed Larry A. May.

"I enjoyed receiving and reading the Fall issue of

OSU Computer Digests Data, Cuts Costs

Ed Starkey, Project Leader of the Oregon State University CPSU, recently completed an analysis of bitterbrush utilization at Lava Beds NM. The monument is an important winter range for mule deer, and levels of utilization have been recorded since 1963. However, no comprehensive analysis had been made, largely because of the great volume of data. Starkey entered the data into a computer at OSU and for less than \$150 obtained summary statistics for the entire period of record.

Utilization was found to be extremely low (10-15%) and there was no discernable trend. Therefore, it was recommended that the monitoring program be suspended indefinitely. Periodic surveys will be conducted to determine whether more intensive monitoring programs should be reinitiated.

This analysis illustrates the cost effective support which can be provided by university based science programs. Park based environmental monitoring often generates more data than can be conveniently managed without the use of a computer. Generally, neither computers nor statistical expertise are readily available in small parks. Thus, data analysis and management provide another linkage in the symbiotic relationship between CPSU's and Parks.

PPS. I believe this will be a valuable publication and will serve a useful purpose."

Donald E. Gardner, Research Scientist, Acting Director, CPSU, University of Hawaii/Manoa.

"Please put us on your mailing list. We will be opening to the public for the first time this spring. Any catalogs, mailing lists, or other publications (on energy, ecology, natural history, etc.) which you feel would help us better serve and/or educate the public will be greatly appreciated. I am the first 'interpretive specialist' at an irrigation dam in Eastern New Mexico. Quite a change from the NPS! Any suggestions?"

John Slevin, Park Technician, U.S. Army Corps of Engineers, Albuquerque District, P.O. Box 345, Santa Rosa, NM 88435

(Editor's Note: How about answering this call for interpretive materials, everyone???)

"An NPS associate sent me a photocopy of several pages of your initial edition of *Pacific Park Science* and it appears to be an impressive entry. Keep up the good work and please add me to your distribution list."

Francis R. Russ, Managing Editor, Fire Management Notes, Forest Service, USDA, Washington, D.C.

Visitors Viewed As Part of Parks

People as a legitimate part of National Parks — as “value creators” who bring their expectations, their attitudes, their hardware and their judgments into park settings — this was the theme of visiting lecturer Donald R. Field on Jan. 13 when he addressed the class on ecological aspects of park management at Oregon State University.

Field quoted Yale Sociologist William R. Burch, Jr., in assigning the origins of natural resources to society rather than to earth alone. Humans impute values, and it is on this value basis that certain things take on “resource” status, he said.

Field used National Parks as an example in describing the naturalness of people and the way human values change over time. He cited Alfred Runte's recent book *National Parks: The American Experience* to show how human perception of the NP System has shifted our view of the resources the System represents. At first there was the idea of something scenic and wondrous, but essentially “worthless” in the economic sense . . . a collection of sites that were interesting but of no particular social value.

Around 1916, recreation began to be seen as an economic factor; hence, parklands became a recreational resource. Then in the Sixties, the view of earth from space put a planetary perspective around our whole world; the ecological values began to emerge and parks suddenly became dichotomized. On one side was the biological system, and on the other were the NPS administration and the visitors. In some areas people were excluded; in others, they were superimposed on the “natural system.” It is Field's contention that people are as natural as the systems they populate.

The emerging challenge to the National Park Service and to society as a whole, Field suggested, is to look at parks as promulgators of change — places where people's evolving values and shifting views of themselves are worked out in ways that allow new insights. He cited studies that show visitor self-regulation; in one case, on a single mile of beach, five distinct user “populations” segregated themselves and co-existed with order and enjoyment for all concerned.

These distinct groups of U.S. park users now are being joined in large numbers by foreign visitors who bring their own cultural tool kits and a different set of values and habits. They too are having their impact on the park resource and parks are beginning to reflect it. (The Japanese — one million of them last year — like to travel to parks in large groups on

public transportation. Their sauna-before-dinner tradition, for instance, can completely deplete a hotel's hot water supply at what, for the hotel, would be an unusual time.)

The changing place of population bulges on the age scale is another significant straw in the park management wind. Field pointed out that the heavy use of back country areas may well taper off as the post World War II baby boom becomes more and more involved in making a living and eventually moves on to geriatric status. He predicted a possible 30 to 45 percent decline in back country use for some parks by 1985-90 from the peak usage in 1976, and pointed to a dramatic decline nationwide since that year. Oregon and Washington, he said, might not experience this tail-off, since the Pacific Northwest is one of the selective youthful growth regions of the country.

Field described the human ecological approach as one that offers management an entire new dimension for comprehending — even predicting — changes occurring in parks. Parks are best understood, he suggested, by looking at them in relation to their surrounding environs — such as examining visitor recreation in relation to logging which may be taking place next door as part of the larger system. Cutting policies, reestablishment of native fisheries, access road-building, public transportation and terminal services, all such things are most useful as information when considered in relation to the different user groups that exist as temporary “park populations” and how those groups interact with one another.

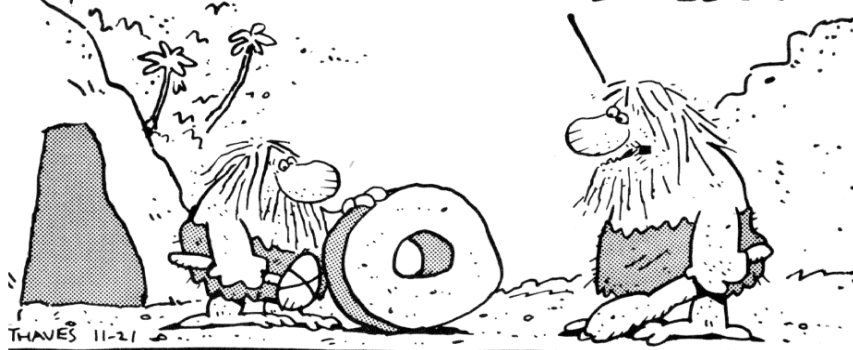
In the Next Issue:

“The Yellowstone Elk: Some Thoughts on Experimental Management,” Doug Houston; “Coastal Management at Gateway NRA” (with food for thought for all urban coast park areas), Herb Cables and John Tanacredi; “Resources Management Plans — The Next Step,” Bill Supernauth; “Natural Resources Information System Development at DSC,” Maurice Nyquist; “Management of Riparian Ecosystems on NPS Lands,” Roy Johnson; “Scientific Management in Rocky Mountain Region,” Jim Thompson; “Acid Rain,” Jay Gogue; and a close-up look at Jim Larson and Al Lovaas and their new jobs.

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**WHEELS ARE ALL VERY GOOD, BUT
I'D LIKE TO GO INTO PURE RESEARCH**

FRANK AND ERNEST by Bob Thaves



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